SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCXVIII.] NOVEMBER, 1900. [PRICE FOURPENCE, or 5s. per ann. post free.

HEAVY RAINFALL IN DURHAM AND NORTHUMBERLAND, ON OCTOBER 26TH, 1900.

A very exceptional fall of rain and snow occurred in Durham and Northumberland on October 26th, more than three inches being recorded at Durham, Sunderland, Newcastle, North Shields and Morpeth. The fall was a prolonged one, lasting about 15 hours, and was accompanied by a gale, but neither lightning nor thunder is reported from the district.

At Sunderland sleet began to fall just after 5 p.m. on Friday, October 26th, and sleet and snow fell continuously until about 10.15 p.m. when it changed to rain which lasted until after 9 a.m. on Saturday, the 27th.

At Newcastle rain and sleet began to fall in earnest about 6 p.m. on Friday, the 26th, and continued, practically without diminution, until 8 a.m. on Saturday, the 27th. Up to midnight on Friday 1·70 in. had fallen, and by 9 a.m. on Saturday 27th a further 2·02 in.

The Observer at the Deaf and Dumb Institution on the Town Moor, remarks that the fall (3·33 in.) is the greatest registered since the observations began in 1868, and exceeds the next greatest fall (2·60 in. on August 12th, 1890) by nearly three quarters of an inch.

How severe was the flooding around Newcastle, and the damage resulting, is shown by the following brief summary of the effect on the North Eastern Railway Company's System. Out of Newcastle the Carlisle line and the south line via Leamside were the only lines working. The north line was completely blocked, the mail train for Edinburgh being sent via Carlisle. The Blyth and Tyne line was open as far as Benton. The Team Valley line was blocked. The Consett line was blocked. The South Shields line was blocked. At noon on Saturday there were no bookings for South Shields except by Cleadon Lane. There were no bookings beyond Tynemouth, and passengers going to Blyth had to book to Tynemouth and walk to Whitley, where they got the connection. Passengers from Alnwick were brought round by Morpeth to Whitley, whence they had to walk to Tynemouth. At Cullercoats the block was still complete.

We have obtained many extra returns of rainfall, which are given in the following table, but still more will be available when the whole of the returns are received at the end of the year.

The area over which the fall exceeded three inches, extends from Durham to Morpeth, or about 30 miles from south to north, but was probably not more than half that amount from east to west. The fall exceeded two inches from Ingleby Greenhow, in North Yorkshire, to Bamburgh, in Northumberland, a distance of nearly 80 miles, while the greatest width was probably about 25 miles.

Rainfall in the North-east of England from October 25th to 28th, 1900.

Stations.	Observers.	October. 25	26	27	28
York, N.R.					
Baldersby	W. Gregson, Esq.	·21	·65	·01	·40
Ingleby Greenhow Vic.	Rev. J. Hawell	·27	2·37	·24	·46
East Layton	Mrs. Proud	·30	·68	...	·53
Middlesborough (Ormesby)	W. S. Tailyour, Esq.	·14	2·52*	·13	·42
,, (Albert Park)	J. M. Parnaby, Esq.	·41	2·85		
Mickleton	Mr. W. Burney	·27	·79	...	·40
Durham.					
Darlington (Elcott, Hurworth)	Rev. W. E. Stewart	·19	2·04	·01	·46
,, (Cleveland Parade)	W. W. Willmott, Esq.	·12	2·03	...	·47
Barnard Castle (County Schl.)	E. Wells, Esq.	·10	1·28	...	·49
Bishop Auckland (The Castle)	Mr. E. Ford	·15	2·38	...	·33
West Hartlepool (Lynn St.)	Mr. H. Lamb	·12	1·45	·10	·17
Wolsingham	Mr. A. Mitchell	·24	2·14	·02	·30
Eastgate (All Saints' Vicarage)	Rev. J. G. B. Knight		1·85		
Wearhead	Mr. Rust	·54	·87	...	·28
Durham (Old Elvet)	T. Eustan Hill, Esq.		3·22		
Ushaw College	Rev. J. Corbishley	·19	2·34	...	·26
Weardale. W. W. (Tunstall)	R. Askwith, Esq., C.E.	·26	2·35	...	·25
,, ,, (Waskerley)	,, ,,	·18	1·08	·48	·07
Consett W. W. (Smiddy Shaw)	,, ,,	·19	1·67	...	·22
Seaham Harbour	Mr. G. H. Aird	·13	2·29	·10	·28
Sunderland (W. Hendon Ho.)	T. W. Backhouse, Esq.	·04	3·28	·23	·19
,,	Councillor Vint		3·65		
Ryton-on-Tyne	J. P. Dalton, Esq.	·16	2·34	...	·22
Northumberland.					
Haltwhistle (Unthank Hall)	Rev. D. Dixon Brown	...	·56	...	·30
Corbridge (Howden Dene)	J. H. Straker, Esq.	·27	1·53	...	·20
Newcastle (Clifton Road)	Dr. Merz	·14	2·38	·01	·23
,, (*Chronicle* Office)	A. Yarrow, Esq.		3·72		
,, (Town Moor)	A. Wright, Esq.	·15	3·33	·01	·22
,, (Welburn Jesmond)	W. H. Holmes, Esq.		3·68		
North Shields (Chirton Cot.)	J. F. Spence, Esq.	·06	3·05	·09	·24
Meldon (Gallowhill Hall)	Mr. J. J. Bray	·25	1·85	...	·13
Scots Gap (Wallington)	Mr. Keith	·29	2·00	·10	·15
Morpeth (Bothalhaugh Lawn)	Hon. and Rev. W. C. Ellis	·17	3·22	...	·12
,, (,, Garden)	,, ,, ,,	·20	3·69	...	·13
Rothbury (Cragside)	W. Bertram, Esq.	·30	2·55	...	·03
Howick Hall	Mr. G. H. Ackroyd	·07	2·85	·03	...
Bamburgh	Mr. W. C. Good	·10	2·22	·03	...
Pawston [Coldstream]	B. P. Selby, Esq.	·26	1·26	·02	...

* Gauge overflowed.

The following notes have been selected to put on record, as far as possible, definite statements, by which the height of the flood can be compared with similar visitations in future. It would be of great scientific interest and much practical utility if the local authorities would put permanent marks of the height reached by the flood, as our old friend, the founder of this Magazine, so often urged in its pages.

NOTES FROM THE NEWSPAPER PRESS.

Arranged from South to North.

YORKSHIRE.

Northallerton.—The town street was inundated from the Town Hall to the Church. The Railway Hotel, and nine adjoining houses, were flooded, and the engine fires of the corn-mill were extinguished.

Middlesborough.—Messrs. Sadler's Chemical Works, the Teeside bridge-works, and the North Ormesby Gasworks, were flooded.

DURHAM.

Darlington.—The river Skerne overflowed, and the low-lying streets were flooded, passengers being carried through in carts.

Stockton.—In Bedford-street the lower rooms of the houses were flooded, and the inhabitants were removed in a boat; several pigs were drowned. Near Eaglescliffe, the water was so deep that trains had to proceed slowly through it.

Hartlepool.—In Murray-street, West Hartlepool, the water was, in places, 6 ft. deep, and hundreds of houses had their basements flooded. At Hart Station, the embankment was seriously undermined, and the end of one of the platforms was washed away.

Durham.—The river overflowed its banks, and along Framwell-gate the water was nearly 2 ft. deep in the lower rooms of the houses. The main road, between Coxhoe and Cornforth, was flooded to a depth of 4 ft., near Cornforth-bridge.

Seaham Harbour.—The railway embankment, midway between Seaham Harbour and Seaham Colliery, slipped away for a distance of about 20 yards, leaving the rails unsupported.

Chester-le-Street.—The main road, which crosses Chester Dene, was seriously damaged, a large portion of it sliding down into the Dene.

Lamesley.—At Long Acre Farm, a cow and three sheep were drowned.

Sunderland.—At Ashbrooke, about 4 a.m., a family in a house at Glen Path was awakened by the sound of water, and took refuge in a neighbour's; it was subsequently found that the water had risen to a height of 8 ft. in the house. Glen Villa was also flooded to a depth of about 6 ft. In some cottages behind St. Luke's-road, Pallion, the water was 3 ft. deep.

NORTHUMBERLAND.

Slaggyford.—A farmer was drowned on his way home from Haltwhistle, having, it is supposed, missed the footbridge in the darkness.

Newcastle District.—At the Teams and Dunston, a huge lake extended from the "Magpie" Inn, at the tram terminus, right round by Canobie-terrace,

Eslington Park Grounds, and along the main road to Dunston. The residents of the "Magpie" Hotel were assisted from the upstairs windows by the aid of a ladder. At the fire-brick works of Messrs. Lucas Bros., the kilns were put out, and it was estimated that 10,000 bricks were washed away. The Team Valley railway was flooded, and the first passenger train did not get through until 10.30 a.m. At Felling Shore two horses were drowned during the night. At Jarrow, at Messrs. Richardson's paper mills, there was four or five feet of water, while at the manager's house it rose almost to the bedroom windows, and at some of the workmen's houses it was above the tops of the street doors. At Jesmond Dene road, stretching for a hundred yards towards the town, there was a great lake, a couple of feet deep, and stretching on either side through the plantations, and on to the Moor. The lake at the Recreation Ground overflowed and flooded the North Road Police Station. The stables behind Jesmond road were flooded so that the policeman on duty deemed it advisable to break open the door, and rescue the horses. At Benton, the farm was standing alone in a lake so deep that the people were driven to the upper storey. The flood reached from the Benton bridge up the burn to the wooden bridge that crosses some hundreds of yards higher up. At Gosforth a carman, who attempted to make his way through the flood by the bridge, had a narrow escape from drowning. In Ash Street an invalid had to be carried from her bed, the water having reached the mattress. At Cullercoats Station the water was level with the platform, a train was derailed and the passengers were taken from it in boats.

The mail train, which left Newcastle at 3.11 a.m., only got between Killingworth and Annitsford, when it had to return, and was sent on to Edinburgh by way of Carlisle.

The South Shields line was blocked, and it was reported that there was nearly 8 ft. of water standing in the Tyne Dock tunnel. At Middle Brunton 50 sheep were drowned, and others at Brunton Farm.

North Shields.—The fish quay was flooded as also were the new electric works at the Low Lights. Two horses were drowned in their stables at the latter place. The body of a woman, who had apparently died from exposure to the severe weather, was found on the railway near Percy Main. At Howdon a woman, who lived at North Bank, was drowned in her house, the water being about 10 ft. deep, the rest of the occupants of the house were rescued through a hole in the roof.

Newsham.—The Co-operative Society's horsekeeper was found dead in about 2 ft. 6 in. of water near the stables.

Blyth.—Turner street, Havelock street, Regent street and Cowpen quay were flooded, and in Folly road four sculling boats were plying during the day, the water being 5 ft. deep in the shop occupied by Mr. Tweedy, printer. In two or three houses the water rose above the key-boards of the pianos. In Folly road the water was up to the window sills of some of the houses.

Morpeth.—There was much flooding of basements at Copper Chore, Flint's-yard, Starth-lane, Mill-square and Low Stanners. The Masonic Hall was flooded, also the nave of St. James's Church, and no service was held on Sunday. At the Wansbeck Iron Works there was about 5 ft. of water, the engine and dynamo being all but covered.

Felton.—At East Thirston five sheep were drowned.

Warkworth.—A retaining wall at Warkworth Bridge was washed away.

Moor Bridge was damaged and Morwick Mill was flooded. It is stated that the Coquet has not been in such flood for about 35 years.

Alnwick.—The river Aln rose to a great height and swept away the Monk's Bridge, Duchess Bridge and Swing Bridge. The famed Peter's Bridge at Denwick Mill was also carried away. At Lesbury the foot bridge was washed away. At Broomhouse Farm 37 sheep were drowned. At Hawkhill the water rose to about a foot from the top of the arch of the bridge. At Flint Mill four beasts were drowned.

OCTOBER WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—The warmth during the past few days has been remarkable, although it has been surpassed several times in recent years. My readings for the past 4 days are as follows :—

October 5–8th, mean max., 64°; mean min., 48°·8; mean, 56°·4. Max. day, 67° on 8th; max. night, 55° on 7th. In 1898, October 4–8th, the mean max. was 61°·2, min. 53°·2, mean 57°·2. On the 5th and 6th the night min. was 56°. 1897 gave a mean of 58° for 5 days, 15th to 19th. The max. on the 19th was 65°. The mean for 8 days, 2nd to 9th, in 1896, was 55°·9.

On October 1st, 1895, the max. was 68°. This, however, was entirely put into the shade by a max. of 74° on October 4th, 1886. The latter reading, together with the 5-day mean in 1897, make an unbeaten record during the last 20 years. Thus it will be noted that the present warmth, so far, cannot claim to establish a record of any kind.

Yours faithfully,

ARTHUR F. PARBURY.

Chiddingfold, Godalming, Surrey.

THE BRITISH ASSOCIATION AT BRADFORD, 1900.

Mean Rainfall of the Northern Counties of England, 1881–90.

To the Editor of the Meteorological Magazine.

SIR,—I see that you draw attention to an error in my table on page 130 of the *Met. Mag.* I was not aware that a single copy had gone out without correction of the printer's error. The value for Derbyshire for September should be 3·25 in. The total, 40·23 in., is correct.

Yours truly,

JOHN HOPKINSON.

REVIEWS.

Regenkarte der Provinzen Westpreussen und Posen. Mit erläutern dem Text und Tabellen. In amtlichen Auftrage bearbeitet von Professor Dr. G. HELLMANN. Berlin, 1900. Dietrich Reimer (Ernst Vohsen). Royal 8vo., pp. 28. *Map.*

PROFESSOR HELLMANN has already published rainfall maps with explanatory text for the provinces of Silesia and East Prussia, and he now continues the series in a map of mean annual rainfall for the decade 1890–99, for the adjoining provinces of West Prussia and Posen. The records discussed are supplied by 213 stations, distributed over an area of 21,000 square miles, equal to that of England north of a line drawn from the Wash to Carnarvon Bay. The rain gauges were of the official Prussian pattern, exposing an area of 31 square inches (about 6¼ inches diameter), at a height of 3 feet 3 inches above ground, and they were read once daily, at 7 a.m.

The provinces under consideration are on the whole low and flat, with a narrow frontage on the Baltic, and running far inland. They are crossed by a low plateau, averaging nearly 300 feet in height, in which one observing station was as high as 900 feet. The area includes the driest part of North Germany, in the low plain, which is separated from the Baltic by the plateau just referred to, and here the mean annual rainfall is under 20 inches. The map distinguishes by six shades of colour differences of rainfall from 450 to 800 mm., or, say, from 18 to 32 inches; and Professor Hellmann points out that in this region of gentle slopes and small elevation the amount of rainfall is roughly proportional to the height of the land, and that the rainfall map closely resembles a map of the vertical relief of the ground. He does not, however, discuss the data of individual stations from this point of view.

The 10-year means, under consideration, are compared with the 45-year means at eleven selected stations, and are found to vary between 7·3 per cent. in excess, and 3·8 per cent. in defect, of the long-period values. The comparison of the rainfall for individual years brings out the fact that the rainfall of the wettest years is more than twice as great as that of the driest years; for a mean rainfall of 25 inches, the heaviest year would be 36, and the lightest 15 inches; or, as 145 per cent. of the average for the wettest year, and 60 per cent. of the average for the driest year. Both these figures are rather lower than the 150 per cent. for the maximum, and 66 per cent. for the minimum, adopted by the late G. J. Symons, as working values for the British Isles, and proved to be applicable to many parts of the world, by Sir A. R. Binnie, in his paper on "Mean or Average Annual Rainfall,"* read before the Institution of Civil Engineers.

* Minutes of Proceedings Inst. C.E. Vol. CIX. Part III.

The number of dry years during which the rainfall is below the average, is rather greater than the number of wet years; the following table for Posen, calculated for 100 years, is fairly representative of the whole region:—

Very dry	(51 to 75 per cent. of average)	... ...	8 years.
Dry	(76 to 100 ,, ,,)	... ...	30 ,,
Wet	(100 to 125 ,, ,,)	... ...	32 ,,
Very wet	(126 to 130 ,, ,,)	... ...	10 ,,

The region is one of summer rain and winter drought; all the stations, at which 45 years means are available, showing a maximum in July, with 13·7 per cent. of the annual rainfall, and a minimum in February with 4·7 per cent.

The greatest short period falls are discussed in some detail, on account of the practical importance of this factor. The average maximum fall in one day was from 1·20 inches to 1·40 inches; but the absolute maximum was 6·07 inches at Wildgarten, in West Prussia, during two thunderstorms on August 2nd, 1896, and of that total no less than 5·28 inches fell in $2\frac{3}{4}$ hours, an average of 1 inch in 20 minutes. Amongst heavy rains the maximum for a period of under five minutes was at the rate of 0·120 inch per minute; the heaviest for an hour was only at the rate of 0·024 inch per minute (excluding the quite abnormal fall at Wildgarten, which was equal to 0·050 inch per minute). The extremely short duration of very heavy rain leads Prof. Hellmann to remark that the favourite practice of engineers in calculating the intensity of rainfall for periods shorter than an hour to 1 hour as a standard, is unsatisfactory and misleading; but it must not be forgotten that as a rule the engineer does not have to deal with the rain until it has run off the surface on which it falls, and in most cases the varying distances which it has to flow have a great equalizing effect.

H. R. M.

New Lands: their resources and prospective advantages, by HUGH ROBERT MILL, D.Sc., &c. Charles Griffin and Co. London, 1900. 8vo, xii.—280 pages, and 10 maps.

THIS is the introductory volume to Griffin's "New Land" series, edited by Prof. Grenville A. J. Cole. In the preface the author tells us that he desired to give "a short, simple and practical account of the conditions of life in those parts of the world where there is still an opening for the energies of English-speaking people desiring to make their home in a new country." It is, therefore, obvious that it is not intended to give an exhaustive treatise on each of the 17 regions to which a chapter is devoted, but the

amount of knowledge conveyed is great, and appears to us to be of precisely the character requisite to give an intending emigrant a general idea of the different countries, before he turned to other sources, for special and detailed information. The book, moreover, is readable, and thoroughly practical.

Referring to our own branch of knowledge, the descriptions of the various climates are lucid and instructive, without being burdened with masses of figures, which convey little meaning, except to the specialist, while we are thouroughly at one with the author when he says, "In almost every case it will be found that the crux of a new land is the water supply. Water, as rain or rivers, is indeed the very life-blood of the habitable world;" and illustrates this by referring to the common Australian calculation of converting inches of rain into number of sheep, or even pounds of wool, per acre. How many, even educated persons in England, realize that all the fresh water in the world is rain, and rain only, and amongst London's millions, how often does the knowledge of water extend beyond the tap, or at most the water-main.

Wragge's Australasian Almanac, 1900, and Weather Guide for Land and Sea. Sapsford and Co. Brisbane, 8vo.

THE enthusiastic meteorologist, Mr. C. L. Wragge, who was the originator of the observations on Ben Nevis, in 1881, has sent us a copy of his Almanac for 1900, which appears to be a sort of "Whitaker," modified to suit the conditions prevailing at the antipodes. It contains a description and views of his latest achievement in Mountain Meteorology—the establishment of an observatory on Mount Kosciusko, 7,328 ft. above sea level, where observations are made every four hours, day and night.

From a list of Meteorological Stations we see that the Queensland Weather Service now comprises 23 first order stations; 48 second order, and 73 climatological stations. There are various specimens of Mr. Wragge's articles, in which he gives christian names to atmospheric disturbances, with a view to popularize meteorology. A most desirable aim, but we must confess to some doubt whether the method adopted is a successful one.

Incidentally, we may mention a temperature reading, which it would be interesting for our readers to enter on the margin of the page in the article on Meteorological Extremes, II.—Temperature, in the number for October, 1899. At Cloncurry, Lat. 20° 43′ S., Lon. 140° 30′ E., and 207 miles from the Gulf of Carpentaria, a verified Negretti, maximum, registered 125° in shade.

PREVENTION OF HAIL BY CANNONADING.*

SEVERAL articles have appeared during the past year in American newspapers and journals urging that some trial be made in this country of the new system of cannonading devised by Mr. Stiger, in order to prevent destruction by hail. Mr. Stiger is a burgomaster of Windisch-Feistritz, Styria, who conceived the idea that by shooting a vortex ring upward into the cloud, he could so disturb the process of the formation of hail as to protect his own vineyards. Within the past five years thousands of the special form of cannon used by him for this purpose, and particularly those devised by G. Suschnig, of the manufacturing firm of Karl Greinitz and Nephews, at Gratz, have been established in northern Italy and southern Austria. Although it is claimed that by firing these cannon frequently, and when placed quite close together, storms have been diverted, yet the details, thus far published, are too meagre to afford a basis for any rational opinion as to whether or no the Stiger system is useful. Inasmuch as there is no reason to believe on *a priori* grounds in its efficacy, we must rely wholly upon a careful discussion of the recorded observations in order to ascertain the efficiency of the cannonading. Such a discussion has not yet come to hand, and will, in fact, be very difficult to make, owing to the absence of the long-continued records that are needed in order to establish normal values. Meanwhile, in order to respond to the popular interest in the subject, the Editor has appealed to Mr. Suschnig for information as to the expense, and other details, attending a fair trial of Stiger's method, and the reply is given below. The printed pamphlets, describing the special shooting apparatus, manufactured at the forges at St. Katharein, on the Lamming, near Bruck, on the Muir, in Styria, enumerate the following types :—

						Crowns.
No. A-200,	cannon	standing	2·8	meters	high, price complete,	110
,, B-250,	,,	,,	2·9	,,	,,	130
,, C-300,	,,	,,	3·3	,,	,,	160
,, D-350,	,,	,,	3·9	,,	,,	200
,, E-400,	,,	,,	4·5	,,	,,	240

These prices include all the apparatus required in the experiment. It must not, however, be supposed that a single cannon or shooting station is sufficient to produce any decided effect. On this point, Mr. Suschnig writes, as follows :—

In regard to your question as to where the apparatus can be obtained in America, I must reply that we have not as yet sent any of the apparatus to America, because none have ever been asked for from that country. We have only delivered apparatus on our own continent because on the other continents interest has not yet been awakened in this important matter. The only

* Reprinted from the *U.S. Monthly Weather Review.*

exception is the Asiatic Indian government, which has announced to us the visit of its delegates for inspection on their way to the Paris Exposition. We believe that the installation of an observing region of 40 square kilometers, with 40 apparatus in 4 lines would be necessary in order that your Government should obtain reliable studies as material for investigation. We would recommend placing in the first of these lines the apparatus of type E–400; in the second line, type D–350; in the third line, type C–300; and in the fourth line, type B–250; we believe that type A–200 can only be used to advantage at places of high altitude (700 to 1,000 meters above sea level).

The apparatus can be sent to America by us either via Genoa and Gibraltar, or via Hamburg.

We consider that the various types of cannon should be adapted to the altitude of the station above sea level. The larger cannon for the lower stations about as shown in the following :—

For altitude 0–200 meters	Type E
For altitude 201–350 meters	Type D
For altitude 351–500 meters	Type C
For altitude 501–650 meters	Type B
For altitude 650 and upwards	Type A

It would seem that if there be any small region in this country peculiarly liable to destructive hail, the Stiger method could be satisfactorily tried by covering this region with forty firing stations, arranged in four lines, each 10 kilometers long and 1 kilometer apart, so as to cover 40 square kilometers. A kilometer is about 0·62 mile, so that 10 kilometers would represent a little over 6 miles. The cost of the apparatus would be about 7,300 crowns, in Austria. Probably, if we include all other expenses, it would cost about $10,000 to start the experiment at any convenient place in the United States. The annual cost of maintenance would depend upon whether each farmer attends to the apparatus himself, or whether several persons are employed to see that the experiment is carried on properly and fairly. We do not recommend any such experiment, since we know of no region of this small size in this country that is troubled, frequently, by destructive hail, and it might easily happen that one would have to wait fifty years before having a good chance to try the efficiency of Stiger's vortices. The frequency with which destructive hail occurs at any spot in this country is about the same as the frequency of local tornadoes, and with hail, as with the tornado, it is more reasonable and cheaper to insure one's self against the financial loss that may be incurred rather than to protect one's self against the material loss that may occur. In either case, we have to spend money, and the loss of money and destroyed material is eventually distributed through the community, just as in the case of fire. Experience has shown that, although up to a certain point, it is wise to protect against fire, yet beyond that point, one may waste his money in attempted protection, and will do better to spend it in insurance against the inevitable accidents of life.

While the above remarks apply more directly to the economy of Stiger's method of preventing hail, they are not to be considered as implying any doubts as to the scientific correctness of his method. On that point we know too little, either for or against, to justify any very decided opinion in this matter.

Inasmuch as we know that hailstorms are usually accompanied by rapidly ascending currents within large cumulus clouds, it may plausibly be supposed that if the vortices from Stiger's cannon could materially interfere with these currents, they might also interfere with the formation of hail. Stiger himself at first supposed that the calm period that preceded the severe local storm was the feature favorable to the formation of hail, and that his cannonading so greatly disturbed this calm as to prevent the hail from forming, but subsequently he thought that his vortices affected the cloud itself.

Our own conviction is that the energy of the movements within the vortex is too slight in comparison with the energy within a hail cloud to justify us in expecting any appreciable mechanical disturbance. On the other hand, the descriptions of the European experiments show that the Stiger vortex is essentially a white cloud of fine particles resulting from the explosion of the gunpowder. Now, a cumulus cloud is, as is well known, composed of aqueous particles condensed primarily upon dust nuclei. We have already (see *Monthly Weather Review*, April, 1900, pp. 156–159) explained how the condensation of moisture within a rising cloud is hindered until a state of extreme supersaturation is attained, because the condensing moisture has no nuclei on which to collect, except the small drops of water already formed. Now, the Stiger vortex brings to the cloud a fresh accession of innumerable dust nuclei, and, moreover, nuclei that are especially favorable to the condensation of moisture. This must, therefore, to a moderate degree, facilitate the formation of new drops of water, and the prevention of that stage of supersaturation as the result of which large drops of water, or large hailstones, or large snowflakes, and balls of snow are formed.

Although this forcible addition of dust nuclei to a thunder cloud may thus possibly have some effect on the cloud and its hail, yet we are bound to confess that even this hypothesis seems to be inapplicable, in view of the fact that in the course of the Dyrenforth experiments, made by himself and others, both in Texas and in New York, both gunpowder and nitroglycerine were sent both by bombshells and small balloons up into the cloud region and exploded there without any appreciable effect, notwithstanding the immense number of particles of dust and powder thus violently thrown into the cloud. The experiments of Carl Barus, for the Weather Bureau, in 1893-94 (see Weather Bureau Bulletin No. 12), showed that the vapours of phosphorus and sulphur were peculiarly effective in producing cloudy condensation. We have, therefore, no good reason for believing that the Stiger vortices can influence even the molecular processes within the cloud.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1900.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, CamdenSquare	73·7	27	35·6	11	63·5	45·1	43·8	70	124·3	30·1	·93	12	6·9
Malta	80·4	25	55·4	7	72·3	59·1	57·4	78	...	...	·55	2	2·1
Cape of Good Hope	79·3	3	42·1	27	68·8	51·8	54·0	80	...	...	3·28	7	4·9
Mauritius	80·6	12	63·1	27	78·8	69·2	65·8	77	142·6	52·8	1·36	17	5·1
Calcutta	99·4	23	69·7	7	95·6	76·1	75·0	71	156·0	65·8	4·17	8	3·9
Bombay	92·5	2	78·0	11	90·8	80·7	75·3	73	141·5	70·6	·00	0	2·1
Ceylon, Colombo	92·7	17	73·8	1	89·8	78·7	77·2	86	143·8	71·7	16·00	14	5·6
Melbourne	73·5	7	38·5	16	59·4	47·1	48·0	86	127·6	32·0	3·83	15	7·1
Adelaide	79·4	6	41·1	12	63·0	49·5	47·2	74	136·5	33·8	2·42	14	7·1
Sydney	70·1	9	43·1	13	63·0	51·8	51·8	83	118·9	35·7	14·28	17	5·0
Wellington	62·5	6	37·0	28	57·3	47·8	44·1	73	105·0	30·0	5·66	22	5·3
Auckland	68·0	3	41·0	16	62·6	52·8	49·1	73	121·0	36·0	7·98	22	7·3
Jamaica, Halfway Tree	90·0	28	70·0	4	86·2	72·5	70·8	77	...	...	4·22	7	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	87·0	6	70·8	19	83·7	74·4	71·1	77	149·2	...	7·51	22	4·1
Toronto	87·5	14	30·5	7	67·1	44·1	44·9	66	103·0	25·1	1·00	6	5·7
New Brunswick, Fredericton	83·7	30	27·0	10	59·1	36·0	33·3	55	...	...	6·18	14	5·5
Manitoba, Winnipeg	91·5	13	14·0	4	74·2	40·4	...	...	...	...	·11	4	4·2
Victoria, British Columbia	65·7	30	42·0	28	59·6	47·6	..	...	...	...	1·04	18	6·8

REMARKS.

MALTA.—Adopted mean temp. 64°·9, or 0°·7 above average. Mean hourly velocity of wind 11·1 miles, or 1·1 above average. Mean temp. of sea 68°·0. TSS on 4 days; L on 17th and 23rd. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·1 above, of dew point 1°·4 above, and rainfall 2·86 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles, or 0·5 mile below the average; extremes, 25·1 on 18th and 1·7 on 25th; prevailing direction, E. by S. to S.S.E. L on 25th and L and T on 26th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·7, or 0°·2 above, of dew point 2°·2 above, and rainfall 3·91 in. above, their respective averages. Mean hourly velocity of wind 8 miles; prevailing direction S.W. TSS on 1st and 14th; L alone on the 13th. H. O. BARNARD.

Adelaide.—Mean temp. 1°·3 below average. Cloud much above, but R ·43 in. below, average. Good average rains in the south of the Colony, but far N. and in the interior, light or altogether wanting. C. TODD, F.R.S.

Sydney.—Temperature 1°·0 below, humidity 7°·3 above, and rainfall 8·85 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally showery weather during this month; variable winds, and often strong from N.W. and S. Fogs on 9 days; slight earthquakes on 21st, at 1.35 p.m., and on 28th at 8.4 a.m. R. B. GORE.

Auckland.—An exceedingly wet and stormy month, the total rainfall being more than 3·75 in. above the average of 32 years. Mean temp. close to the average. T. F. CHEESEMAN.

JAMAICA.—Rainfall 1·56 in. below the average. MAXWELL HALL.

SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1900.

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·20	XI.	Builth, Abergwesyn Vic.	9·37
II.	Dorking, Abinger Hall .	2·11	,,	Rhayader, Nantgwillt ...	8·33
,,	Birchington, Thor	1·92	,,	Lake Vyrnwy	8·95
,,	Hailsham	3·35	,,	Corwen, Rhug	5·53
,,	Ryde, Thornbrough	...	,,	Criccieth, Talarvor	4·29
,,	Emsworth, Redlands ...	2·50	,,	I. of Anglesey, Lligwy..	5·37
,,	Alton, Ashdell	2·59	,,	I. of Man, Douglas	5·97
III.	Oxford, Magdalen Coll..	2·30	XII.	Stoneykirk, Ardwell Ho.	4·28
,,	Banbury, Bloxham	2·26	,,	New Galloway, Glenlee	7·89
,,	Northampton, Sedgebrook	1·88	,,	Moniaive, Maxwelton Ho.	5·59
,,	Alconbury	...	,,	Lilliesleaf, Riddell	4·13
,,	Wisbech, Bank House...	2·12	XIII.	N. Esk Res. [Penicuick]	5·65
IV.	Southend	1·44	XIV.	Glasgow, Queen's Park..	5·05
,,	Colchester, Lexden	1·50	XV.	Inverary, Newtown	8·18
,,	Saffron Waldon, Newport	1·97	,,	Ballachulish, Ardsheal...	8·97
,,	Rendlesham Hall	1·62	,,	Islay	5·87
,,	Scole Rectory	...	XVI.	Dollar.....	4·50
,,	Swaffham	2·39	,,	Balquhidder, Stronvar...	8·09
V.	Salisbury, Alderbury ...	2·53	,,	Coupar Angus Station...	3·47
,,	Bishop's Cannings	3·12	,,	Blair Atholl	3·37
,,	Blandford, Whatcombe .	3·46	XVII.	Keith H.R.S.....	4·79
,,	Ashburton, Holne Vic...	4·74	,,	Forres H.R.S.	3·22
,,	Okehampton, Oaklands.	4·42	XVIII.	Fearn, Lower Pitkerrie..	2·32
,,	Hartland Abbey	5·23	,,	S. Uist, Askernish	4·85
,,	Lynton, Glenthorne ...	6·80	,,	Invergarry.....	3·80
,,	Probus, Lamellyn	3·01	,,	Aviemore, Alvie Manse.	4·12
,,	Wellington, The Avenue	3·02	,,	Loch Ness, Drumnadrochit	3·49
,,	North Cadbury Rectory	2·76	XIX.	Invershin	4·81
VI.	Clifton, Pembroke Road	3·99	,,	Durness	9·80
,,	Ross, The Graig	4·10	,,	Watten H.R.S.....	3·24
,,	Wem, Clive Vicarage ...	3·26	XX.	Dunmanway, Coolkelure	10·43
,,	Wolverhampton, Tettenhall	3·01	,,	Cork, Wellesley Terrace	5·21
,,	Cheadle, The Heath Ho.	3·56	,,	Killarney, Woodlawn ..	10·29
,,	Coventry, Priory Row ..	2·97	,,	Caher, Duneske	3·49
VII.	Market Overton	1·80	,,	Ballingarry, Hazelfort...	4·40
,,	Grantham, Stainby	2·06	,,	Limerick, Kilcornan ...	3·69
,,	Horncastle, Bucknall ...	1·68	,,	Miltown Malbay	7·11
,,	Worksop, Hodsck Priory	2·62	XXI.	Gorey, Courtown House	3·79
VIII.	Neston, Hinderton	4·57	,,	Moynalty, Westland ...	5·05
,,	Southport, Hesketh Park	4·57	,,	Athlone, Twyford	6·55
,,	Chatburn, Middlewood.	7·31	,,	Mullingar, Belvedere ...	4·78
,,	Duddon Val., Seathwaite Vic.	10·50	XXII.	Woodlawn	6·98
IX.	Melmerby, Baldersby ...	3·73	,,	Crossmolina, Enniscoe ..	8·48
,,	Scalby, Silverdale	4·05	,,	Collooney, Markree Obs.	5·35
,,	Ingleby Greenhow Vic..	6·13	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	5·62	,,	Warrenpoint.....	4·46
X.	Haltwhistle, Unthank H.	4·94	,,	Seaforde.....	4·88
,,	Bamburgh	5·10	,,	Belfast, Springfield	4·86
,,	Keswick, The Bank	6·38	,,	Bushmills, Dundarave..	5·15
XI.	Llanfrechfa Grange	5·87	,,	Stewartstown	4·78
,,	Llandovery	7·31	,,	Killybegs	6·39
,,	Castle Malgwyn	4·51	,,	Horn Head	5·96
,,	Brecknock, The Barracks	...			

OCTOBER, 1900.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·86	— 1·03	·54	29	15	73·8	8	34·2	16	0	4
II.		Tenterden	2·07	— 1·96	·51	29	18	75·0	8	34·0	16	0	5
,,		Hartley Wintney	2·22	...	·62	29	15	70·0	9	32·0	22	1	12
III.		Hitchin	2·15	— ·92	·43	28	19	70·0	8, 9	32·0	21	1	...
,,		Winslow (Addington)	2·21	— ·88	·46	29	18	71·0	9	31·0	11*a*	3	9
IV.		Bury St. Edmunds (Westley)	2·25	— 1·02	·41	28	19	70·0	8	32·0	21	1	...
,,		Norwich (Brundall)	2·26	...	·55	26	20	75·0	9	31·5	4	1	2
V.		Winterbourne Steepleton ...	2·64	...	·42	28	18	61·7	7	32·6	11	0	9
,,		Torquay (Cary Green)	2·03	...	·61	4	17	63·4	7	37·2	22	0	0
,,		Polapit Tamar [Launceston]..	3·78	— 1·15	·63	3	20	63·9	8, 9	25·0	22	3	3
VI.		Stroud (Upfield)	3·39	+ ·36	·63	4	17	68·0	7	33·0	21	0	...
,,		Church Stretton (Woolstaston)	3·93	+ ·16	·62	4	23	67·0	8	34·0	27	0	5
,,		Worcester (Diglis Lock)	2·41	— ·42	·47	4	16	...	...	...	...	...	...
VII.		Boston	2·16	— ·95	·96	26	15	75·0	9	31·0	22	2	...
,,		Hesley Hall [Tickhill].....	2·80	— ·30	·72	4	16	69·0	7	30·0	4	2	...
,,		Breadsall Priory	2·70	...	·64	4	18	...	...	...	...	...	...
VIII.		Manchester (Plymouth Grove)	4·77	+ 1·40	·84	6	22	71·0	7	33·0	20	0	2
IX.		Wetherby (Ribston Hall) ...	4·32	+ 1·19	1·02	4	22	...	...	...	...	...	...
,,		Skipton (Arncliffe)	10·20	+ 4·17	1·31	5	25	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·88	— ·77	·82	26	22	70·0	9	29·0	4	2	10
X.		Newcastle (Town Moor)	6·85	+ 3·73	3·33	26	17	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	14·55	+ 3·96	1·91	9	23	61·7	9	30·3	16	2	...
XI.	WALES.	Cardiff (Ely).....	5·81	+ 1·27	·95	25	20	...	...	...	...	...	...
,,		Haverfordwest	6·11	+ ·96	1·21	5	21	62·9	8	29·7	22	1	7
,,		Aberystwith (Gogerddan) ...	6·77	+ 1·42	1·05	4	22	68·0	8	...	...	...	...
,,		Llandudno.....	5·46	+ 2·07	·75	5	24	65·5	7	38·2	22	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	5·79	+ 2·53	1·26	4	21	62·0	7	28·0	16	2	...
XIII.		Edinburgh (Blacket Place)...	4·87	...	·97	17	22	65·3	7	30·4	16	2	7
XIV.		Colmonell	6·11	...	1·17	4	22	65·0	18	28·0	21	...	...
XV.		Tighnabruaich	6·54	...	·88	31	24	54·0	24	31·0	15	1	...
,,		Mull (Quinish).....	8·52	+ 3·23	1·15	7	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·80	+ ·84	·70	7	14	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·65	+ 1·41	·65	6	20	62·1	24	27·8	16	3	...
XVII.		Braemar	3·41	— ·20	·58	4	23	57·8	8	27·3	26*b*	5	17
,,		Aberdeen (Cranford)	3·38	...	·66	4	24	60·0	24	27·0	25	7	...
,,		Cawdor (Budgate)	3·55	+ ·82	·40	29	23	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	6·77	+ 2·12	1·83	8	13	..	...	...	...	...	...
,,		Glencarron Lodge.....	10·37	...	1·86	7	26	58·0	7, 8	28·0	16	1	...
XIX.		Dunrobin	2·76	— ·55	·64	13	15	58·0	8	32·0	26	1	...
,,		S. Ronaldshay (Roeberry) ...	4·40	+ ·67	1·02	4	29	56·0	7	37·0	25	0	...
XX.	IRELAND.	Darrynane Abbey.....	4·24	...	·80	29	23	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	4·16	+ ·34	·58	3, 8	19	64·5	24	29·0	11	4	...
,,		Broadford (Hurdlestown) ...	...	...	...	...	...	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·95	+ ·66	·55	3	20	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	3·47	+ ·09	·69	9	21	66·4	7	36·7	28	0	5
XXII.		Ballinasloe	6·30	+ 3·31	·98	8	26	56·0	23	32·0	18	1	...
,,		Clifden (Kylemore)	8·90	...	1·16	30	23	...	...	...	...	...	...
XXIII		Waringstown	4·22	+ 1·51	·55	8	20	64·0	4	30·0	27*c*	7	10
,,		Londonderry (Creggan Res.).	6·02	+ 2·35	·69	6	30	...	...	...	...	...	...
,,		Omagh (Edenfel)	6·02	+ 2·92	·80	28	25	62·0	7	30·0	26	5	8

+ Shows that the fall was above the average ; — that it was below it.

a—and 16, 22. *b*—and 31. *c*—and 29.

METEOROLOGICAL NOTES ON OCTOBER, 1900.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Dry till the last week. The mean temp. was similar to that of the previous three Octobers, but there were three warmer days and several colder ones. The nights were warmer than in 1899, but not so warm as in 1898. Duration of sunshine, 125 hours. Fog on 7th and 11th.

HARTLEY WINTNEY.—A remarkably mild month, with warm and sunny days almost throughout. The last 10 days were showery, with T and H on the 29th. Rainfall 1·02 in. below the average. Owing to the absence of severe frost, trees and shrubs retained their foliage till the last. Swallows were last seen on 8th. Ozone registered on 9 days, with a mean of 4·5. S.W. gale on 28th. Fog on 9th.

WINSLOW, ADDINGTON.—A month of changeable weather. R fell on a good many days, but the total was less than the average. Slight frost on several nights, and in low situations tender plants were destroyed, but on higher ground even dahlias were only slightly injured, and there were plenty of blooms on the 31st. A good many chrysalides of the deathshead hawkmoth were found when digging potatoes, a most unusual thing in this part of the country. Fog on 3 mornings. H showers on 14th and 26th.

BURY ST. EDMUNDS, WESTLEY.—Hardly any frost; tender plants not touched. T on the 10th.

NORWICH, BRUNDALL.—Mild, with rainfall about three-quarters of an inch deficient. L on 5th, 14th, 21st and 26th. H on 21st and 26th. The max. temp. is the highest in October since 1895.

WINTERBOURNE STEEPLETON.—There was no very heavy R, and until the last week the fall was only slight, although there were many rainy days. The nights were generally mild, frost being recorded only on the grass.

TORQUAY, CARY GREEN.—R 2·10 in. below the average. Mean temp. 1°·5 above the average. Ozone mean, 5·9; greatest daily amount 7·5 on 27th, with W. wind; least, 4·0 on 8th with S.W. wind, and on 20th with N.W. wind. Duration of sunshine, 28 hours 30 mins. more than the average; four sunless days.

POLAPIT TAMAR [LAUNCESTON].—The temp. was higher than usual throughout the month. S.W. gale on 4th; T and L on 5th; heavy H on 26th.

MANCHESTER, PLYMOUTH GROVE.—Fine autumn weather prevailed during the greater part of the month. Fog occurred on four days; dense on 7th and 8th.

ARNCLIFFE.—A very wet month, with little frost.

NEWCASTLE, TOWN MOOR.—The fall of R on 26th, 3·33 in., is the highest registered here since observations began in 1868. The next largest fall was 2·60 in., on August 12th, 1890.

WALES.

HAVERFORDWEST.—A wet, cloudy month. From the 4th to the 9th a moderate to fresh gale blew almost without intermission, with L on 4th and TSS on 5th. The temp. throughout the month was high, the min. on several nights being above 50°. The duration of sunshine was 58·7 hours. Short TSS at 10 a.m. and 7.40 p.m. on 5th, accompanied by very heavy R and H. Grass was plentiful, but agricultural operations were backward.

ABERYSTWITH, GOGERDDAN.—A very wet month and very mild, but with little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—One of the most unpleasant months of October experienced in 40 years. The land has never before been known to be so thoroughly saturated. Farm work almost at a standstill.

COLMONELL, CLACHANTON.—R 1·44 in. above, and mean temp. 2°·3 above, the average of 24 years.

TIGHNABRUAICH.—The bar. was very unsteady, the rainfall above the average, and the temp. low.

ABERDEEN, CRANFORD.—A cold and wet month, with little sunshine.

S. RONALDSHAY, ROEBERRY.—A very wet and cold month. Mean temp. 45°·7, or 1°·0 below the average of 10 years.

IRELAND.

DARRYNANE ABBEY.—The wettest month since December, 1899. There were a few fine days between the 16th and 23rd, but the last week was very wet, with a fall of 1·90 in. H on 4th; L on 16th.

DUBLIN, FITZWILLIAM SQUARE.—A changeable, rainy, and damp month. A period of unusual warmth occurred from the 6th to the 9th inclusive; the 31st also was warm. Mean temp. 50°·4, or 0°·7 above the average. L and H on 26th; high winds on 11 days, attaining the force of a gale on three. More or less fog on five days. Lunar halos on two days. Duration of sunshine, 127 hours, 15 minutes.

OMAGH, EDENFEL.—The wettest October since 1870, the fall having reached almost twice the average, and on the few rainless days the atmosphere nearly approached saturation. This, accompanied by an equable temp., above the normal, and little or no frost, delayed the autumn tints and the subsequent fall of the leaf by a full fortnight, the latter being far from complete even at the close.